

Synthesis of Inter-Plant Water Network Involving Multiple Contaminants

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Abstract:

Minimization of freshwater consumption and wastewater generation are being critical concerns in the process industry due to the increase scarcity in freshwater supply, the rise of freshwater and effluent treatment costs and more stringent regulations. One of the efficient ways to reduce freshwater consumption in the process is by recycling and/or reusing wastewater that is generated by the process or utility after being treated to acceptable limits. Traditional industrial water conservation practices mainly focused on the 3R strategy (reduce, reuse and recycle) within an individual plant and this strategy can be implemented by using water system integration technique. In order to improve the water recovery, Chew et al. [1] extends the single plant water network into integration of inter-plant water network via cross-plant pipelines or centralized utility hub. This work presents the development of a systematic approach for synthesizing indirect inter-plant water network integration with centralized regeneration system involving multiple contaminants. In this approach, water reuse prospects were analysed within individual plants and between different plants via inter-plant water integration possibilities. The water network problem is formulated as mixed integer nonlinear programming (MINLP) solved based on the water network superstructure. The applicability of the proposed approach is illustrated using an industrial case study. At the end of this study, significant reductions of freshwater consumption and wastewater generation have been achieved, showing the effectiveness of the proposed approach. The results obtained give higher percentage reduction of the freshwater consumption and wastewater generation is 47.61% and 53.48% respectively.

Keywords : Freshwater Supply; Reusing Wastewater; Integration Technique

Acknowledgement

The authors would like to thank Universiti Malaysia Pahang for the financial support (RDU1703181).